Universal relation listed all the data items required for the application.

Then we apply 1NF. We removed repetitive data, make sure that each cell contains one single value.

Then move on to 2NF. We define the primary key, and partition the table to make sure all the attributes are fully functionally dependent.

Then move on to 3NF. We divide our table again, to make sure there has no transitive functional dependencies.

1NF

Member Information

Member_ID Men	ember_Name E	Email_address	Identity	Loan_Credit	Available_Loans	Borrowing_Copies
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Loan Information

Loan_Record_Number	Member ID	Item ID	Lending Date	Due Date	Return Date	Expired Days	Overdue or not	Fine
	_	_	J—	_	_	,		

Item Information

<u>Item_ID</u>	Item_name	Туре	Loan_period
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Item Inventory

Item_Name Loan_pe	riod Total_stock
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Item Location

Item_Name	Floor	Shelf	Class
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Reservation Information

Reservation_Record_Number	Member_ID Item_ID	Reservation_Date	Time_Remaining_for_pick_up	Number_of_refusals
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Account Status



Member	ID	Total_	_Fine	State

2NF

Member Information

Member_ID	Member_Name	Email_address	Identity	Available_Loans	Borrowing_Copies
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Identity Loan_Credit

We can derive Loan_Credit from Identity, so Loan_Credit doesn't depend on Member_ID.

Loan Information

Ī	oan Record Number	Member_ID	Item_ID	Lending_Date	Due_Date	Return_Date	Expired_Days	Overdue_or_not	Fine

Item Information

Item_ID	Item_ID	Item_name	Туре	Loan_period
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Item Inventory

<u>Item_name</u>	Туре	Loan_period	Total_stock
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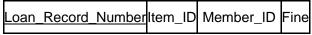
Item Location

item name Floor_number Shelf_number Class_number
--

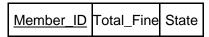
Reservation Information

Reservation Record Number	Member ID	Item ID	Reservation Date	Time_Remaining_for_pick_up	Number of refusals
Ttooorvation_rtooora_rtainioor			1100011411011_5410	Time_reamailing_rea_place_ap	110111001_01_10100010

Booking Entries



Account State



3NF

Member Information

Member_ID Member_Name	Email_address Identity	Borrowing_Copies
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Member name, Email address, identity and borrowing copies are all depend on member id, which means no transitive dependency exists.

Identity	Loan_Credit
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A member's identity determines how many books he can borrow, i.e., loan credit. No transitive dependency here.

Loan Information

Loan_Record_Number Member_ID

Member ID, Item ID, Lending Date, Due Date, Return Date all correspond with Loan Record Number, which means no transitive dependency exists here.

Expire Information

Item number	Due_Date	Return_Date	Lending_Date	Expired_Days	Overdue_or_not	Fine
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Due date, return date, lending date, expired days, overdue or not and fine are fully dependent on item number, which means there is no dependency here.

Item Information

Item_ID	Item_name	Stock state
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Item name and stock state fully dependent on item id, so there is no transitive dependency here.

Item Inventory

Type, loan period, total stock are dependent on item name, so there is no transitive dependency here.

Item Location

item_name Floor_number	Shelf_number	Class_number
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Floor number, shelf number, class number are all dependent on item name. So there is no transitive dependency here.

Reservation Information

Member id, item id, reservation date, and number of refusals are all correspond with reservation record number, so there's no transitive dependency here.

Reservation Act

Reservation Record Number	Act Date	Accept_Or_Refuse
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Act date and accept_or_refuse are dependent on reservation record number. So no transitive dependency exits.

Account State

Member_ID	Total_Fine	State
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Total fine and state all depend on member ID.